



Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force



Success Story

AFRL DEMONSTRATES UPPER SURFACE BLOWING CONCEPT



Powered lift technology may one day increase the speed range at which large air vehicles, such as tanker or transport aircraft, can fly. Powered lift could enable these air vehicles to fly at speeds just above a hover, without interfering with maximum speed. In addition, it may decrease the ground footprint required for takeoff and landing.



Air Force Research Laboratory
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Accomplishment

AFRL scientists worked with Compositex, Inc., as part of a Small Business Innovation Research program to prove the upper surface blowing (USB) concept as one method to achieve powered lift. Engineers successfully demonstrated USB during the flight test of a small unmanned air vehicle (UAV) that weighed approximately 6 lbs. Not only did the demonstration's success prove the possibility of using USB technology, it also opened up possibilities for using the same type of small UAV to demonstrate future air vehicle concepts.

Background

In this version of USB, airflow generated by a ducted fan channels into a plenum inside the wing instead of exhausting through a conventional nozzle. The flow then exits the plenum through a narrow, aft-facing blowing slot that runs along the wingspan on the upper side of the wing just aft of the leading edge. The resulting jet entrains air over the wing's upper surface, similar to the "ejector" concept. It also acts like a "jet flap," thus increasing both thrust and lift. This increase should enable very low-speed flight as well as short takeoff and landing operations.

Engineers have examined powered lift since the 1950s; however, they have had little success putting the theory into practice. One obstacle to successful implementation has been weight and efficiency penalties due to the plumbing. Another obstacle, low-speed performance, often comes with a severe cruise drag penalty. The current effort targets risk reduction by demonstrating the concept in a small UAV, where design changes can be made inexpensively and rapidly.

Air Vehicles
Emerging Technology

Additional Information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (05-VA-07)